Physics Lib. copy
Weber.

VOLUME 44 SECOND SERIES

CONTENTS

JULY 1, 1933

Interpretation of the Azimuthal Effect of Cosmic Radiation . . . . . M. S. VALLARTA 1
Airplane Cosmic-Ray Intensity Measurements . LEWIS M. MOTT-SMITH AND LYNN G. HOWELL 4
General Derivation of the Formula for the Diffraction by a Perfect Grating . CARL ECKART 12
Radiation from Canal Ray Impact . . . . . F. L. VERWIEBE 15
Inelastic Electron Scattering by Helium Atoms . . . A. L. HUGHES AND J. H. MCMILLEN 20
Quantum Mechanical Cross Section for Ionization of Helium by Electron Impact . W. W. WETZEL 25
Quantum Statistics of Almost Classical Assemblies . . . . . JOHN G. KIRKWOOD 31
Magnetic Quadrupole Field and Energy in Cubic and Hexagonal Crystals . L. W. MCKEEHAN 38
Variation of the Magnetic Properties of Barium with Temperature . . . . . C. T. LANE 43
On Irregularities in Magnetization . . . . . K. J. SIXTUS 46

Letters to the Editor:

Cosmic-Ray Nuclear Disintegrations . . . . . W. F. G. SWANN AND C. G. MONTGOMERY 52
Scattering of Molecular Rays in Gases . . . . . R. M. ZABEL 53
On the Production of the Positive Electron . . . . . J. R. OPPENHEIMER AND M. S. PLESSET 53
Emission of Alpha-Particles from Various Targets Bombarded by Deutons of High Speed . . . . . GILBERT N. LEWIS, M. STANLEY LIVINGSTON AND ERNEST O. LAWRENCE 55
Emission of Protons from Various Targets Bombarded by Deutons of High Speed . . . . . ERNEST O. LAWRENCE, M. STANLEY LIVINGSTON AND GILBERT N. LEWIS 56
Masses of the Lithium Isotopes . . . . . KENNETH T. BAINBRIDGE 56
Comparison of the Masses of H^2 and Helium . . . . . KENNETH T. BAINBRIDGE 57
Suggested Dependence of Nuclear Moments on Atomic Number . . . . NORMAN S. GRACE 58
Fine Structure of H^2 Alpha . . . . FRANK H. SPEDDING, C. D. SHANE, AND NORMAN S. GRACE 58
Failure to Detect Radioactivity in Beryllium with the Linear Amplifier . . . . . ROBLEY D. EVANS AND M. C. HENDERSON 59
Extension of Fowler's Theory of Photoelectric Sensitivity as a Function of Temperature . . . . . A. T. WATERMAN AND C. L. HENSHAW 59
Nuclear Spin and Magnetic Moment of Sodium from Hyperfine Structure . . . . . C. M. VAN ATTA AND L. P. GRANATH 60
Isotopes of Calcium by the Magneto-Optic Method . WENDELL M. LATIMER AND HERBERT A. YOUNG 61

JULY 15, 1933

Natural Widths of the $K\alpha$ X-Ray Doublet from 26FE to 47AG . . . . SAMUEL K. ALLISON 63
Electron Diffraction by Liquids . . . . . LOUIS R. MAXWELL 73
Magnetic Interaction of a Valence Electron with Inner Shells . . . . . M. H. JOHNSON, JR., AND G. BREIT 77
Zeeman Effect for Perturbed N_2^+ Terms . . . . . ALLAN E. PARKER 84
Rotational Analysis of the Perturbed (13, 15) $^2\Sigma - ^2\Sigma$ N_2^+ Band . . . . ALLAN E. PARKER 90
Pressure Effects of Foreign Gases on the Sodium D-Lines . . . . . HENRY MARGENAU AND WILLIAM W. WATSON 92
Infrared Spectrum of Carbon Dioxide. Part II . . ARTHUR ADEL AND DAVID M. DENNISON 99
Multiplets in the Spectra of O III, O IV, O V and C III . P. GERALD KRUGER AND W. E. SHOUPP 105
Comparison of the Nuclear Theories of Heisenberg and Wigner. I . . . . CARL ECKART 109
Magnetized Spheroid Immersed in a Permeable Medium . . . . . LEIGH PAGE 112
Temperature Dependence of Young's Modulus for Nickel . . . . . JERROLD ZACHARIAS 116

Letters to the Editor:

General Form of the Equation of State for a Monoatomic Ideal Gas . . . . . G. POLVANI 123
Equivalence of Mass and Energy . . . . . KENNETH T. BAINBRIDGE 123
Space Density of Cosmic-Ray Particles . . . . . W. F. G. SWANN 124
Study of Images of Small Areas Formed with Feeble Light . . J. Q. STEWART AND A. M. SKELLETT 125
Asymmetry of the Cosmic Radiation at Swarthmore . THOMAS H. JOHNSON AND E. C. STEVENSON 125
Band Spectrum of NaK . . . . . F. W. LOOMIS AND M. J. ARVIN 126

Proceedings of the American Physical Society:

SALT LAKE CITY MEETING, June 15, 1933; Minutes and Abstracts 1–20, Author Index . . . 128

AUGUST 1, 1933

Diffuse Scattering of X-Rays from Sylvine. IV. Scattering at High Temperatures . G. G. HARVEY 133
Scattering of X-Rays from Powdered Crystals at Low Temperatures . . . . . G. E. M. JAUNCEY AND FORD PENNELL 138
Structure of the X-Ray *K* Absorption Limits of the Elements Manganese to Zinc . A. H. BARNES 141
Relative Intensities and Transition Probabilities of the *K*-Series Lines of the Elements 24 to 52 by the Ionization Chamber Method . . . . . JOHN H. WILLIAMS 146
Mass Ratio of the Lithium Isotopes from the Spectrum of Li_2 . . . . ANDREW MCKELLAR 155
Emission Spectrum of Molecular Hydrogen in the Extreme Ultraviolet . . C. RULON JEPPESEN 165
Resolution of the Two Difference Bands of CO_2 Near 10μ . E. F. BARKER AND ARTHUR ADEL 185
Variation with Temperature of the Continuous Absorption Spectrum of Diatomic Molecules: Part I. Experimental, The Absorption Spectrum of Chlorine . . . . . G. E. GIBSON AND NOEL S. BAYLISS 188
Variation with Temperature of the Continuous Absorption Spectrum of Diatomic Molecules: Part II. Theoretical . . . . . G. E. GIBSON, O. K. RICE AND N. S. BAYLISS 193
Application of the FP-54 Pliotron to Atomic Disintegration-Studies . . . L. R. HAFSTAD 201
Charge Distributions in Fluorine and Neon . . . . . F. W. BROWN 214
Application of Liouville's Theorem to Electron Orbits in the Earth's Magnetic Field . . . . . W. F. G. SWANN 224
Absolute Saturation of Cubic Cobalt . . . . . ROBERT I. ALLEN AND F. W. CONSTANT 228
Erratum: Theory of Continuous Absorption of Oxygen at 1450A . E. C. G. STUECKELBERG 234

Letters to the Editor:

Dependence of the Absorption of Neutrons on Their Velocity . . . . . T. W. BONNER 235
Heat Capacity of Gadolinium Sulfate Octahydrate Below 1° Absolute . . . . . W. F. GIAUQUE AND D. P. MACDOUGALL 235
Disintegrations of Neon Nuclei by Fast Neutrons . . . . . WILLIAM D. HARKINS, DAVID M. GANS AND HENRY W. NEWSON 236
On the Production of Positive Electrons by Electrons . . . W. H. FURRY AND J. F. CARLSON 237
Relative Abundances of Elements of Even and Odd Mass Number and Atomic Number . T. E. STERNE 238
Isotopic Constitution of Lithium in the Sun . . . . . EDWIN MCMILLAN 240
Inability of X-Rays to Decompose Water . . . . HUGO FRICKE AND E. R. BROWNSCOMBE 240

AUGUST 15, 1933

Secondary and Tertiary Particles Produced by Cosmic Rays . . . . J. H. SAWYER, JR. 241
New High-Altitude Study of Cosmic-Ray Bands and a New Determination of Their Total Energy Content . . . . . I. S. BOWEN, R. A. MILLIKAN AND H. V. NEHER 246
Relations Among Fluctuations of the Cosmic-Ray Ionization, of the Terrestrial Magnetic Field, of the Atmospheric Potential Gradient, and of the Absolute Humidity . . . . . JAMES W. BROXON, GEORGE T. MERIDETH AND LOUIS STRAIT 253
X-Ray Line Intensities and Cathode-Ray Retardation in Thick Targets of Silver . . . . . D. L. WEBSTER, W. W. HANSEN AND F. B. DUVENECK 258
Relative Abundance of Hydrogen Isotopes . . . WALKER BLEAKNEY AND AUSTIN J. GOULD 265
Effect of Exchange on the Scattering of Slow Electrons from Atoms . . . . . PHILIP M. MORSE AND W. P. ALLIS 269
Effect of Temperature on the Emission of Electron Field Currents from Tungsten and Molybdenum . . . . . A. J. AHEARN 277
Absorption Spectra of the Samarium Ion in Solids. III. Absorption of $Sm(BrO_3)_3 \cdot 9H_2O$ and a Partial Energy-Level Diagram for the Sm^{+++} Ion as It Exists in Crystalline $Sm(BrO_3)_3 \cdot 9H_2O$ . . . . . FRANK H. SPEDDING AND RICHARD S. BEAR 287
Charge Distributions for the Normal Atoms from Boron to Neon . . . . . F. W. BROWN, J. H. BARTLETT, JR., AND C. G. DUNN 296
Density of Energy in the Universe . . . . . S. A. KORFF 300
Some Remarks on the Frequency Dependence of Superconductivity and Ferromagnetism . . . . . RAYMUND SÄNGER 302

Letters to the Editor:

On the Theory of Real Crystals . . . ADOLF G. SMEKAL 308
Band Spectra Measurement of Mass . . . ARTHUR BRAMLEY 309
Failure to Detect the Radioactivity of Beryllium with the Wilson Cloud Chamber . . . DAVID M. GANS, WILLIAM D. HARKINS AND HENRY W. NEWSON 310
Measurements on the Effect of Light on Spurious Contact Potentials and "Trapped" Electrons . . . WAYNE B. NOTTINGHAM 311
Effect of Grinding and Etching on a Pair of Split Calcite Crystals . . . F. K. RICHTMYER, S. W. BARNES AND K. V. MANNING 311

Proceedings of the American Physical Society:

CHICAGO MEETING, June 19–24, 1933; Minutes and Abstracts 1–81, Author Index . . . 313

SEPTEMBER 1, 1933

Effect of Positive Space Charge in Collector Analysis of Discharges . . . R. H. SLOANE AND K. G. EMELEUS 333
Test of the Classical "Momentum Transfer" Theory of Accommodation Coefficients of Ions at Cathodes . . . K. T. COMPTON AND E. S. LAMAR 338
New Method for Determining the Thermionic Work Functions of Metals and Its Application to Nickel . . . GERALD W. FOX AND ROBERT M. BOWIE 345
Fine Structure in the *K* X-Ray Absorption Spectrum of Bromine . . . SEYMOUR TOWN STEPHENSON 349
Remarkable Optical Properties of the Alkali Metals . . . R. W. WOOD 353
Nuclear Moments and Their Dependence upon Atomic Number and Mass Number . . . NORMAN S. GRACE 361
Absorption Spectrum of Diatomic Bismuth . . . G. M. ALMY AND F. M. SPARKS 365
Absorption Spectrum of Chlorine Dioxide . . . Z. W. KU 376
Intensity Distribution in a Band System of Symmetrical Triatomic Molecules . . . Z. W. KU 383
Far Infrared Absorption Spectra of Ammonia and Phosphine Gases under High Resolving Power . . . NORMAN WRIGHT AND H. M. RANDALL 391
Dispersion of the Kerr Electro-Optic Effect in the Short Infrared Spectrum . . . L. R. INGERSOLL AND WESLEY R. WINCH 399
Cosmic-Ray Positive and Negative Electrons . . . CARL D. ANDERSON 406

Letters to the Editor:

Concerning W. T. Sproull's Article on "Diffraction of Low Speed Electrons by a Tungsten Single Crystal" . . . H. E. FARNSWORTH 417
Comments on W. T. Sproull's Article "Diffraction of Low Speed Electrons by a Tungsten Single Crystal" . . . G. P. THOMSON 417
Be III $1snp\ ^1P_1 - 1s^2\ ^1S_0$ Series . . . P. GERALD KRUGER AND F. S. COOPER 418
Isotope Shift of Tl . . . G. BREIT 418
Isotopes of Chlorine . . . EDNA R. BISHOP AND FRED ALLISON 419
Combination Relation in the Absorption Spectrum of Liquid Oxygen . . . JOSEPH W. ELLIS AND HANS O. KNESER 420
Lead Isotopes by the Magneto-Optic Method . . . JOHN H. YOE 420
Magnetostatic Oscillator for the Generation of 1 to 3 cm Waves . . . C. E. CLEETON AND N. H. WILLIAMS 421

SEPTEMBER 15, 1933

Evaporation of Atoms, Ions and Electrons from Caesium Films on Tungsten . . . JOHN BRADSHAW TAYLOR AND IRVING LANGMUIR 423
Nature of Gas Ions . . . OVERTON LUHR 459
Collisions of Neutrons with Protons . . . FRANZ N. D. KURIE 463
Fluorescence of Diatomic Molecules of Antimony . . . J. GENARD 468
Hyperfine Structure in Intermediate Coupling . . . G. BREIT AND LAWRENCE A. WILLS 470
New Analysis of Slater's Compressibility Data . . . H. M. EVJEN 491
Contribution to the Theory of Heteropolar Crystals . . . H. M. EVJEN 501

Letters to the Editor:

Raman Spectra of Three Amines . . . P. L. BAYLEY 510
On the Recombination of Electrons and Positrons . . . ENRICO FERMI AND GEORGE E. UHLENBECK 510
Hyperfine Structure and Nuclear Moment of Gold . . . JOHN WULFF 512
Stability of Beryllium . . . W. F. LIBBY 512
On the Nature of Cosmic-Ray Showers . . . BENEDICT CASSEN 513
Artificial Production of Neutrons . . . H. R. CRANE, C. C. LAURITSEN AND A. SOLTAN 514
Azimuthal Asymmetry of Cosmic Radiation . . . S. A. KORFF 515

OCTOBER 1, 1933

L X-Ray Spectrum of Solid Aluminum . . . T. H. OSGOOD 517
Absorption of NaCl, KCl and KI in the Far Ultraviolet . . . ALBERT SMITH 520
Continuous Absorption Spectrum of Helium . . . J. P. VINTI 524
Disintegration of the Nuclei of Nitrogen and Other Light Atoms by Neutrons. I . . . WILLIAM D. HARKINS, DAVID M. GANS AND HENRY W. NEWSON 529
Isotope Shift in Neon . . . J. H. BARTLETT, JR., AND J. J. GIBBONS, JR. 538
Multiplet Separations and Perturbed Terms . . . N. G. WHITELAW 544
Quantum Defect of Nonpenetrating Orbits, with Special Application to Al II . . . J. H. VAN VLECK AND N. G. WHITELAW 551
Nuclear Spin of Li^7 from Hyperfine Structure Data . . . NEWTON M. GRAY 570
Heats of Dissociation of Hydrogen and Nitrogen . . . W. WALLACE LOZIER 575
Magnetic Dipole Fields in Unsaturated Cubic Crystals . . . L. W. MCKEEHAN 582
Measurements on Contact Potential Difference Between Different Faces of Copper Single Crystals . . . BERNHARD A. ROSE 585
On the Existence of Time Lags in the Faraday Effect . . . J. S. WEBB AND D. R. MOREY 589

Letters to the Editor:

Experimental Determination of the Distribution of Conduction Electrons in Metals . . . H. M. O'BRYAN AND H. W. B. SKINNER 602
Hyperfine Structure of the Rare Earths . . . NORMAN S. GRACE 603
Note on the Accommodation Coefficient for Helium . . . WALTER C. MICHELS 604
Atomic Polarization of CO . . . L. A. MATHESON 604

OCTOBER 15, 1933

X-Ray Satellites of High Atomic Number Elements . F. K. RICHTMYER AND SIDNEY KAUFMAN 605
Soft X-Rays from (100) and (111) Faces of Copper Single Crystals . . MORGAN L. WILLIAMS 610
Decay of Luminescence and Light Absorption in Phosphorescent Materials . D. H. KABAKJIAN 618
Theory of Forced Double Refraction . . . K. F. HERZFELD AND R. H. LEE 625
Magnetic Rotation Spectrum of the Red Bands of Sodium . . . W. R. FREDRICKSON AND CARL R. STANNARD 632
Spectrum of Sulphur Dioxide . . . TUNG-CHING CHOW 638
On the Inversion of Doublets in Alkali-Like Spectra . . . MELBA PHILLIPS 644
Application of Probabilities to the Counting of Alpha-Particles . . . NORMAN I. ADAMS, JR. 651
Exponential Law of Radioactive Disintegration . . . ARTHUR E. RUARK 654
Calculation of Characteristic Values for Periodic Potentials . . . HAROLD D. KOENIG 657
Energy Levels of the Rare-Gas Configurations . . . GEORGE H. SHORTLEY 666
Half-Life of Actinouranium and the Problem of Geologic Time . . . FORREST WESTERN AND ARTHUR E. RUARK 675
Electro-Optical Kerr Effect in Gases . . . C. W. BRUCE 682
Errata.—Variation of the Principal Magnetic Susceptibilities of Certain Paramagnetic Crystals with Temperature . . . B. W. BARTLETT 687

Letters to the Editor:

Ionization of the Noble Gases by Positive Alkali Ions.—A Correction . J. CARLISLE MOUZON 688
Possibility of Electric Charge . . . A. LANDÉ 689
Emission and Fluorescence Spectra of Sulphur Dioxide . . . H. D. SMYTH 690
Isotopes of Hydrogen by the Magneto-Optic Method. The Existence of H^3 . . . WENDELL M. LATIMER AND HERBERT A. YOUNG 690
Raman Spectrum of Gaseous Carbon Dioxide . . . ARTHUR ADEL 691
Allison Magneto-Optic Effect . . . L. B. SNODDY 691
Production of Neutrons by High Speed Deutons . H. R. CRANE, C. C. LAURITSEN AND A. SOLTAN 692

NOVEMBER 1, 1933

Experimental Study of the Widths and Shapes of the $K\alpha$ X-Ray Doublet from Ca (20) to Ni (28) . . . LYMAN G. PARRATT 695
Energy Distribution in Cosmic Rays . . . W. G. POLLARD 703
Positive Ion Excitation of Mercury Vapor . . . ERNEST J. JONES 707
Doppler Effect in Spectra of Positive Rays of Uniform Velocity in Argon, Neon, Helium . . . ANNA I. MCPHERSON 711
Electron Diffraction by Hydrocarbons . . . H. R. NELSON 717

New O_2^+ Bands. Dissociation Energy of O_2^+ and Ionization Potential of O_2 . . . . . R. S. MULLIKEN AND D. S. STEVENS 720
Analysis of Zeeman Patterns . . . . . RUSSELL A. FISHER 724
Characteristic Values of the Two Minima Problem and Quantum Defects of *f* States of Heavy Atoms . . . . . TA-YOU WU 727
Configuration Interaction in Complex Spectra . . . . . C. W. UFFORD 732
Relative Multiplet Transition Probabilities from Spectroscopic Stability . . . . . E. U. CONDON AND C. W. UFFORD 740
Hyperfine Structure Intensities of the $2^3S_1 - 2^3P_{0,1,2}$ Triplet in Optically Excited Mercury Vapor . . . . . M. L. POOL AND S. J. SIMMONS 744
Pressure Effects of Nitrogen on Potassium Absorption Lines . . . . . WILLIAM W. WATSON AND HENRY MARGENAU 748
Relative Intensity Tables for Spectrum Lines. . . . . H. E. WHITE AND A. Y. ELIASON 753
Arc Spectrum of Sulfur in the Ultraviolet . . . . . J. E. RUEDY 757
Quenching of Iodine Fluorescence by Iodine and Argon . . . . . JAMES F. KOEHLER 761
On the Cooling of a Radioactive Sphere . . . . . ARNOLD N. LOWAN 769
Magnetic Susceptibility of MnO as a Function of the Temperature . . RAYEN WELCH TYLER 776

Letters to the Editor:

Ionization Potential of Be III . . . . . BENGT EDLÉN 778
Distribution of Cosmic-Ray Nuclear Disintegration in Time . . . . . C. G. MONTGOMERY AND D. D. MONTGOMERY 779
Neutrons from Cosmic-Ray Stösse . . . . . GORDON L. LOCHER 779
Neutrons from Deutons and the Mass of the Neutron . . . . . M. STANLEY LIVINGSTON, MALCOLM C. HENDERSON AND ERNEST O. LAWRENCE 781
Neutrons from Beryllium Bombarded by Deutons . . . . . M. STANLEY LIVINGSTON, MALCOLM C. HENDERSON AND ERNEST O. LAWRENCE 782
Unusual Nitrogen Tube . . . . . JOSEPH KAPLAN 783
On the Production of Neutrons from Lithium . . . . . H. R. CRANE AND C. C. LAURITSEN 783
Production of High Velocity Ions and Electrons . . . . . J. W. BEAMS AND L. B. SNODDY 784
Faraday Effect at High Frequencies . . . . . G. P. HARNWELL, W. BLEAKNEY, S. N. VAN VOORHIS AND J. B. H. KUPER 785

NOVEMBER 15, 1933

Changes in the X-Ray Diffraction Pattern of Nitrobenzene Produced by an Electric Field, Changes in Temperature and Circulation . . . . . F. C. TODD 787
Diffuse Scattering of X-Rays from Sodium Fluoride. II. Scattering at the Temperature of Liquid Air . . . . . G. E. M. JAUNCEY AND P. S. WILLIAMS 794
Transmission of Waves Through an Ionized Gas . . . . . R. W. REVANS 798
Field Electron Emission from Liquid Mercury . . . . . J. W. BEAMS 803
Magnetic Deflection Method for Angular Distribution of Electrons Scattered by Gas Molecules . . . . . A. PHARO GAGGE 808
Zeeman Effect and Uncoupling Phenomena in the CaH Bands . . . . . W. P. CUNNINGHAM AND WILLIAM W. WATSON 815
Limitations of the Theory of Complex Spectra . . . . . H. H. MARVIN 818
New Terms in the Spectra of N III, N IV, N V, O III, O IV, and O V . WILLOUGHBY M. CADY 821
Standard Copper Wave-Lengths in the Region 100A to 450A . . . . . P. GERALD KRUGER AND F. S. COOPER 826
Thermionic Constants for Platinum . . . . . H. L. VAN VELZER 831
Variation with Temperature of the Electrification Produced in Air by the Disruption of Water Drops and Its Bearing on the Prevalence of Lightning . . . . . JOHN ZELENY 837
Magnetic Analysis of Nickel Films Deposited by Evaporation . . . . . H. N. OTIS 843
Ferromagnetism of Nickel Colloids . . . . . S. RAMACHANDRA RAO 850

Letters to the Editor:

Forbidden Lines in the Arc Spectrum of Lead . . . . . HENRYK NIEWODNICZANSKI 854
Properties of Rochelle Salt . . . . . HANS MÜLLER 854
Azimuthal Asymmetry of the Cosmic Radiation in Colorado . . . . . E. C. STEVENSON 855
Scattering Processes Produced by Electrons in Negative Energy States . . . . . O. HALPERN 855
On the Calculation of the Coefficient C in Frank's Formula for Change of Resistance . K. K. SMITH 856
Preliminary Report of the Results of Angular Distribution Measurements of the Cosmic Radiation in Equatorial Latitudes . . . . . THOMAS H. JOHNSON 856
Alpha-Particles from Radium C′ . . . . . H. A. WILSON 858
Disintegration Energies of Radioactive Nuclei . . . . . H. A. WILSON 858
Discrepancy Between Theory and Experiment in Cold Emission . . . . WILLARD H. BENNETT 859

DECEMBER 1, 1933

Effect of Temperature on the Energy Distribution of Photoelectrons. I. Normal Energies . . . . . LEE A. DUBRIDGE AND R. C. HERGENROTHER 861
Effect of Temperature on the Energy Distribution of Photoelectrons. II. Total Energies . . . . . WALTER W. ROEHR . 866
Reflection of Electrons from Liquid Mercury . . ROBERT B. BRODE AND EDWARD B. JORDAN 872
Electron Scattering in Methane, Acetylene and Ethylene . A. L. HUGHES AND J. H. MCMILLEN 876
Electron Attachment and Negative Ion Formation in Oxygen and Oxygen Mixtures . . . . . NORRIS E. BRADBURY 883
Photoelectric Yields in the Extreme Ultraviolet . . . . . CARL KENTY 891
Plasticity of Rocksalt and Its Dependence upon Water . . . . . R. BOWLING BARNES 898
Raman Effect in Ammonia and Some Other Gases . . . . . CHARLTON M. LEWIS AND WILLIAM V. HOUSTON 903
Rotational Structure of the Raman Band (0000)→(020±2) in Linear Symmetrical Molecules YX_2 . . . . . J. RUD NIELSON 911
Further Analysis of the N_2^+ Bands . . . . . ALLAN E. PARKER 914
Nuclear Spin of Phosphorus from Band Spectrum Analysis . . . . . MURIEL F. ASHLEY 919
New Bands in the Electronic Band Spectrum of Neutral OH . . . . . KATHERINE CHAMBERLAIN AND HAROLD B. CUTTER 927
Asymmetries of Pressure Broadened Spectral Lines . . . . . HENRY MARGENAU 931
Nuclear Spin and Magnetic Moment of Sodium from Hyperfine Structure . . . . . L. P. GRANATH AND C. M. VAN ATTA 935

Letters to the Editor:

Attempt to Discover Radiation at Low Critical Potentials in Mercury Vapor . . . . . C. W. JARVIS AND E. N. SHAWHAN 943
Representation of Radiation Reaction in Wave Mechanics . . . . . W. F. G. SWANN 943
Thermoelectric Force of Thin Films . . . . . E. A. JOHNSON AND LOUIS HARRIS 944
Inert Gas Molecules . . . . . K. G. EMELEUS AND O. S. DUFFENDACK 945
Disintegration of Fluorine Nuclei by Neutrons and the Probable Formation of a New Isotope of Nitrogen (N^{16}) . . . . WILLIAM D. HARKINS, DAVID M. GANS AND HENRY W. NEWSON 945
New Band System in Nitrogen . . . . . JOSEPH KAPLAN 947
Convenient Proton Source . . . . . E. S. LAMAR AND OVERTON LUHR 947
Li^+ Fine Structure and Wave Functions near the Nucleus . . . JOHN A. WHEELER AND G. BREIT 948
Production of Positives by Nuclear Gamma-Rays . . . LEO NEDELSKY AND J. R. OPPENHEIMER 948
Hyperfine Structure in the Tantalum Arc Spectrum . . EDWIN MCMILLAN AND NORMAN S. GRACE 949

Proceedings of the American Physical Society:

MIDDLETOWN MEETING OF THE NEW ENGLAND SECTION, October 14, 1933; Minutes and Abstracts 1–19, Author Index 951

DECEMBER 15, 1933

Relative Intensities of Certain *L*-Series X-Ray Satellites in Cathode-Ray and in Fluorescence Excitation . . . . . F. R. HIRSH, JR., AND F. K. RICHTMYER 995
Measurement of the Ionization Per Centimeter of Path by Individual Secondary Cosmic Rays . . . . . W. F. G. SWANN 961
X-Ray Diffraction in Long Chain Liquids . . . . . B. E. WARREN 969
Measurement of X-Ray Emission Wave-Lengths in the *M*-Series by Means of the Ruled Grating . . . . . E. G. PURDOM AND J. M. CORK 974
***K* Absorption Discontinuities of the Elements Zirconium to Iodine** . . . . . P. A. ROSS 977
Infrared Bands and Molecular Constants of HBr . . . . E. K. PLYLER AND E. F. BARKER 984
Multiplet and Hyperfine Structure Analyses of Bi IV. Discussion of Perturbation Effects . . . . . A. B. MCLAY AND M. F. CRAWFORD 986
Hyperfine Structure Absorption in Optically Excited Mercury Vapor . . . . . M. L. POOL AND S. J. SIMMONS 997
Production of Secondary Electrons by Argon Positive Ions and by Argon Atoms . . . . . CHARLES J. BRASEFIELD 1002
Electron Orbits in Crossed Electric and Magnetic Fields . . . . . A. E. SHAW 1006

Electron Diffraction and the Imperfection of Crystal Surfaces . . . . . L. H. GERMER 1012
Effect of Alkali Ions on the Photoelectric Emissivity of Tungsten . . . A. KEITH BREWER 1016
Measurement of the Townsend Coefficients for Ionization by Collision . FREDERICK H. SANDERS 1020
Hoffmann Stösse and the Origin of Cosmic-Ray Ionization . . . . . W. F. G. SWANN 1025

Letters to the Editor:

Magnetic Moment of the Proton . . . . . ALFRED LANDÉ 1028
Electronic Atomic Weight and e/m Ratio . . . . . R. C. GIBBS AND R. C. WILLIAMS 1029
Emission of Electricity from Columbium . . . . . H. B. WAHLIN AND L. O. SORDAHL 1030
Influence of Nitrogen and Carbon Dioxide upon the Absorption Spectrum of Mercury Vapor . . . . . R. W. WOOD AND H. W. STRAUB 1030
Spectrum of $O^{16}H^2$ . . . . . HERRICK L. JOHNSTON AND DAVID H. DAWSON 1031
On the Breakdown of the Coulomb Law for the Hydrogen Atom . E. C. KEMBLE AND R. D. PRESENT 1031
Infrared Spectrum of Heavy Ammonia—ND_3 . . . . . S. SILVERMAN AND J. A. SANDERSON 1032
Author Index to Volume 44 1033
Analytic Subject Index to Volume 44 1041